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**APPLICATION FOR LETTERS PATENT**

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**Portable, Folding Storage Structures with  
Carrying Case and Methods Therefor**

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## **TECHNICAL FIELD**

**[0001]** This disclosure pertains to portable foldable storage structures and to methods for erecting, contracting and storing such structures.

## **BACKGROUND OF THE INVENTION**

**[0002]** In society today, many individuals enjoy spending time traveling in recreational vehicles, campers, motor homes, trailers, and boats. In fact, many people live in such vehicles on either a full-time or on a part-time basis. Unfortunately, it is common for such vehicles to have limited storage space, and many personal items are therefore stored or stowed either within or attached to such vehicles.

**[0003]** This lack of adequate storage creates many problems. For example, when stopping in campgrounds, recreational vehicle parks, or in other locations, many individuals would like to store their personal items outside of their vehicles. However, the rules and regulations of many campgrounds and recreational vehicle parks do not allow the storage of personal items in an open manner. Therefore, there is a need for storage structures which will satisfy such storage needs.

**[0004]** Numerous foldable structures have been developed over the years. Such foldable structures have been used for various purposes.

Although some of these structures can be used for storage, such structures  
tend to be bulky, heavy, and difficult to erect. Such structures have not  
typically been sufficiently lightweight and foldable or collapsible to be easily  
transported and/or stored. Providing such a structure which is weather  
tight is difficult and even more so while maintaining portability. Thus, the  
prior art structures have various shortcomings and have failed to adequately  
resolve some of the problems faced by those who would benefit from  
portable and collapsible storage structures.

**[0005]** In brief, there has long been a need for a portable, collapsible,  
foldable, durable, and light weight storage structure which is quickly and  
easily erected from a stored configuration. There has also been a need for  
such a storage structure which can be easily collapsed to facilitate  
transportation and storage.

**[0006]** The current invention addresses one or more of these problems  
and challenges using a number of features that provide an improved  
portable, collapsible structure and related methods.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0007]** Preferred embodiments of the invention are described below with reference to the following accompanying drawings.

**[0008]** FIG. 1 is a perspective view of a foldable storage structure in accordance with one embodiment of the present invention.

**[0009]** FIG. 2 is a front elevational view of the foldable storage structure of FIG. 1.

**[0010]** FIG. 3 is a rear elevational view of the foldable storage structure of FIG. 1.

**[0011]** FIG. 4 is an exploded perspective view of the foldable storage structure of FIG. 1, showing the wall assembly, the roof assembly, the floor assembly, and other aspects of the invention.

**[0012]** FIG. 5 is a perspective view of the wall assembly in isolation according to one embodiment of the present invention.

**[0013]** FIG. 6 is a perspective view of the wall assembly of Figure 5 from the opposite end.

**[0014]** FIG. 7 is an elevational view of a preferred flexible basket weave hinge of FIG. 3.

**[0015]** FIG. 8A is a diagrammatic perspective view showing the wall  
assembly in folded configuration in accordance with one embodiment of the  
present invention.

**[0016]** FIG. 8B is a diagrammatic perspective view showing the wall  
assembly of FIG. 8A in a partially folded configuration.

**[0017]** FIG. 8C is a diagrammatic perspective view showing the wall  
assembly of FIG. 8A in a partially folded configuration.

**[0018]** FIG. 8D is a diagrammatic perspective view showing the wall  
assembly of FIG. 8A in a partially folded configuration.

**[0019]** FIG. 8E is a diagrammatic perspective view showing the wall  
assembly of FIG. 8A in an unfolded configuration.

**[0020]** FIG. 9A is a diagrammatic top view showing the wall assembly  
of FIG. 8A.

**[0021]** FIG. 9B is a diagrammatic top view showing the wall assembly  
of FIG. 8B.

**[0022]** FIG. 9C is a diagrammatic top view showing the wall assembly  
of FIG. 8C.

**[0023]** FIG. 9D is a diagrammatic top view showing the wall assembly  
of FIG. 8D.

**[0024]** FIG. 9E is a diagrammatic top view showing the wall assembly  
of FIG. 8E.

**[0025]** FIG. 10 is a top view showing the foldable roof member in  
accordance with one embodiment of the present invention.

**[0026]** FIG.11 is a top view showing a roof skin or shell which includes  
a flexible pouch in accordance with some preferred forms of the present  
invention.

**[0027]** FIG. 12 is a top view showing the roof member of FIG. 10  
being placed into the roof shell with flexible pouch of FIG. 11 in accordance  
with one embodiment of the present invention.

**[0028]** FIG. 13 is a top view showing the roof assembly in accordance  
with one embodiment of the present invention.

**[0029]** FIG. 14A is a diagrammatic elevational view showing the roof  
member in folded configuration in accordance with one embodiment of the  
present invention.

**[0030]** FIG. 14B is a diagrammatic elevational view showing the roof  
assembly of FIG. 14A in a partially folded configuration.

**[0031]** FIG. 14C is a diagrammatic elevational view showing the roof  
assembly of FIG. 14A in a partially folded configuration.

**[0032]** FIG. 14D is a diagrammatic elevational view showing the roof  
assembly of FIG. 14A in an unfolded configuration.

**[0033]** FIG. 15 is a top view showing floor assembly in accordance with  
one embodiment of the present invention.

**[0034]** FIG. 16A is a diagrammatic elevational view showing the floor  
member in folded configuration in accordance with one embodiment of the  
present invention.

**[0035]** FIG. 16B is a diagrammatic elevational view showing the or  
assembly of FIG. 16A in a partially folded configuration.

**[0036]** FIG. 16C is a diagrammatic elevational view showing the floor  
assembly of FIG. 16A in an unfolded configuration.

**[0037]** FIG. 17 is a top view of a second preferred combined roof skin  
and carrying case according to the invention.

**[0038]** FIG. 18 is a bottom view of the roof and case shown in FIG. 17.

**[0039]** FIG. 19 is view similar to FIG. 18 with portions of the bottom  
layer broken away to show the folded parts of the collapsible, portable  
structure contained therein.

**[0040]** FIG. 20 is a bottom view similar to FIG. 18 but with a  
longitudinal flap turned up and over other portions to close the roof pouch  
opening.

**[0041]** FIG. 21 is another bottom view similar to FIGS. 18 and 20 but  
with an end flap folded over to make the collapsed structure and carrying  
pouch more compact.

**[0042]** FIG. 22 is a view similar to FIG. 21 with additional straps shown  
that are fitted around the assembly to hold it securely and act as handles  
for easy portability.



## **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

### **INTRODUCTORY NOTE**

**[0043]** The readers of this document should understand that the embodiments described herein may rely on terminology used in any section of this document and other terms readily apparent from the drawings and language common therefor. This document is premised upon using one or more terms with one embodiment that will in general apply to other embodiments for similar structures, functions, features and aspects of the invention. Wording used in the claims is also descriptive of the invention. Terminology used with one, some or all embodiments may be used for describing and defining the technology and exclusive rights associated herewith.

### **THE FOLDABLE STORAGE STRUCTURE IN GENERAL**

**[0044]** FIGS. 1-4 show a preferred structure according to the present invention, which is generally indicated by the numeral 10. The apparatus 10 can be generally described as being a foldable storage structure. As will be described in detail below, the foldable storage structure 10 can be placed in a folded configuration to facilitate storage and/or transport of the storage structure 10. The storage structure 10 is preferably placed in an

erect configuration (as shown in FIGS. 1-3) so that it can be used for storing personal items, providing privacy, child's play, or for any other suitable purpose. A full description of the foldable storage structure 10, including descriptions of its erect and folded configurations is provided below.

**[0045]** When in its erect configuration, the storage structure 10 advantageously rests on a supporting surface 12. As shown in FIGS. 1 - 4, straps 14 can be included for attaching the bottom corners 16 of the storage structure 10 to the ground or other supporting structure. The straps 14 can include grommets 17 which are located near the end of each of the tie-down straps 14. Tie-down straps 14 are used to secure the storage structure 10 to the supporting surface 12 below as needed or desired. For example, stakes 20 can be inserted through the grommets 17 and driven into the supporting surface 12 to secure the storage structure 10 to the supporting surface 12. The storage structure 10 can also be secured to the supporting surface 12 by other suitable means. For example, straps 14 and grommets 17 can be used as a point of attachment to a wooden deck using nails or screws (now shown), if desired.

## THE WALL ASSEMBLY

**[0046]** Referring to FIGS. 1-9, the foldable storage structure 10 includes a wall assembly or assemblies generally indicated by the numeral 30. In some preferred versions the walls are joined as a single assembly. Other configurations may be possible. Some aspects of the wall assembly 30 may best be appreciated with reference to FIGS. 5, 6 and 9E, where the wall assembly 30 is shown in isolation. For example, referring to FIGS. 5, 6, and 9E, the wall assembly 30 (shown in its unfolded configuration) can be seen to be a polygonal shape, such as the rectangular enclosure 31 shown. In the context of this document, the term "rectangular" is defined to mean any four-sided structure preferably having four approximately right angles at the corners. This includes square figures.

**[0047]** As shown, wall assembly 30 includes four walls, a front wall 33, a back wall 34, a right wall 35, and a left wall 36. Each of these four walls 33, 34, 35, and 36 may include at least two wall panels. As shown in FIGS. 5, 6 and 9E, the front wall 33 can include a first wall panel 41 and a second wall panel 42. The back wall 31 can include of a first wall panel 43 and a second wall panel 44. The right wall 35 can include a first wall panel 46 and a second wall panel 47. The left wall 36 can include a first wall panel 48 and a second wall panel 49. The eight wall panels (*e.g.*, wall panels 41,

42, 43, 44, 46, 47, 48, and 49) which when expanded into the open condition collectively form the rectangular enclosure 31 can be referred to hereafter as wall panels 50 for convenience.

**[0048]** As shown in FIGS. 5, 6 and 9E, each of the wall panels (41, 42, 43, 44, 46, 47, 48 and 49) has an interior facing side 55 and an exterior facing side 56. In addition, each of the wall panels 50 has a top edge 60, a bottom edge 61, and side edges 62.

**[0049]** Referring now to FIGS. 5-6 and 9E, in its erect or unfolded configuration, the wall assembly 30 can be described as a rectangular enclosure 31 having foldable joints or hinged couplings 70 between adjacent panels. In one preferred implementation, the wall assembly 30 is a rectangular enclosure 31 having foldable joints 70 which define eight wall panels which are advantageously stiff as needed for the intended use (*e.g.*, wall panels 41, 42, 43, 44, 46, 47, 48, and 49). The shape of the rectangular enclosure 31 may best be appreciated by the top view provided in FIG. 9E. This figure clearly shows the eight rigid wall panels 50 and the foldable joints 70. However, other views of the wall panels 50 and the foldable joints 70 may be appreciated in any of FIGS. 1-6.

**[0050]** In one implementation, the rectangular enclosure 31 can comprise one continuous piece of wall material having foldable joints 70

which define the eight rigid wall panels (*e.g.*, wall panels 41, 42, 43, 44, 46, 47, 48, and 49). In another implementation, the walls of the rectangular enclosure 31 can include a plurality of individual wall panels 50 which are hingedly coupled at foldable joint or coupling 70. Thus in one embodiment, the rectangular enclosure 31 can include a plurality of individual wall panels 50 which are foldably or hingedly coupled.

**[0051]** A preferred material of construction for the wall and other relatively stiff panels is an extruded plastic (polypropylene) corrugated board material sold under the trademark COROPLAST which is widely available. It has hollow compartments running longitudinally with connecting webs that join the inner and outer facing layers. Other material may be suitable, but this preferred material is water resistant and of particular utility for the inventions described herein.

**[0052]** The rigid panels 50 which comprise the wall assembly 30 are preferably lightweight, to facilitate set-up and take down of the storage structure 10. Such panels 50 can be made of various suitable materials in addition to the preferred material described above. For example, suitably rigid panels 50 can comprise materials selected from the group consisting of such extruded plastic hollow core board, cardboard, honeycomb plastic,

foam core board, polyvinylchloride sheets, metal, wood, and wood based  
composite materials.

**[0053]** It should be noted that the height of the wall panels 50 can be  
varied or adapted to accommodate a variety of roof shapes. For example,  
the storage structure 10 shown in FIGS. 1-4 has a gambrel roof shape.  
However, the height of the wall panels 50 can be adapted to accommodate  
any suitable roof shape. For example, gable roofs, shed roofs, or flat roofs  
can be used in place of the gambrel roof.

## **PANEL HINGES**

**[0054]** Referring now to FIGS. 1-6, the wall assembly 30 can  
advantageously include eight wall panels 50. Each of the wall panels (*e.g.*,  
wall panels 41, 42, 43, 44, 46, 47, 48, and 49) having a top edge 60, a  
bottom edge 61, and two side edges 62. These edges can thus define the  
individual wall panels (*e.g.*, wall panels 41, 42, 43, 44, 46, 47, 48, and 49).  
These eight individual wall panels (*e.g.*, wall panels 41, 42, 43, 44, 46, 47,  
48, and 49) can be coupled by hinges to form the rectangular enclosure 31  
and allow collapsing. For example, the side edges 62 of the wall panels 50  
can be hingedly coupled (at coupling 70) to form the rectangular enclosure  
31. This may be best seen in reference to FIG. 6, which shows one of the

side edges 62 of the first wall panel 43, and one of the side edges 62 of the second wall panels 44 being hingedly coupled (at coupling 70) to help form the rectangular enclosure 31.

**[0055]** The preferred hinged couplings 70 which join the wall panels 50 can be made of various suitable materials. For example, in one implementation at least one of the hinged couplings 70 which join the wall panels 50 can comprise a material selected from the group consisting of nylon strapping, webbing, fabric, plastic, leather and belting. The hinged couplings 70 can be attached to the storage structure 10 by various suitable means. For example, in one implementation the hinged couplings 70 can be attached to the storage structure 10 by adhesives, double-faced tape, screws, bolts, braids, and/or heat welding. The preferred form may vary dependent upon the hinge and panel materials being used.

**[0056]** In one implementation, which may best be appreciated with reference to FIGS. 1-7, the hinged coupling 70 which join the wall panels 50 are a flexible basket weave hinge 75 made of flexible nylon strapping. This same type of flexible basket weave hinges 75 can also be used to foldably or hingedly join other parts of the storage structure 10 (as shown in FIGS. 1-16) as will be discussed below.

**[0057]** A detailed description of the flexible basket weave hinges 75 is now provided with particular attention directed to FIGS. 3 and 7. Referring first to FIG. 3, the illustration shows the back wall 34 of the storage structure 10. The back wall 34 can be made up of two rigid wall panels (*i.e.*, first wall panel 43 and second wall panel 44) which are attached at the hinged coupling 70. Although any suitable coupling may be used for hinged coupling 70, the first and second wall panels 43, 44, are in some forms most preferably coupled with a basket weave hinge 75. A segment of the basket weave hinge 75 (from FIG. 3) is shown in greater detail in FIG. 7.

**[0058]** Referring now to FIG. 7, a portion of the basket weave hinge 75 (from FIG. 3) is shown coupling the first wall panel 43 to the second wall panel 44. The basket weave hinge 75 can be made of a series of short segments of nylon strap 76. Each of these short segments of nylon strap 76 have a first end 78 which is attached to the first wall panel 43, and a second end 79 which is attached to the second wall panel 44. The ends of the nylon straps 76 can be attached to the first and second wall panels 43, 44 by any suitable means. For example, in one implementation, the nylon straps 76 can be attached by adhesive or sewn or both.



**[0059]** The hinge 75 is formed in a "basket weave" pattern, so that if one nylon strap 76 has its first end 78 attached to the interior facing side 55 of the first wall panel 43, then its second end 79 will be attached to the exterior facing surface 56 of the second wall panel 44. An adjacent nylon strap 76 which is part of the basket weave hinge 75 will alternate this arrangement, therefore its first end 78 will be attached to the exterior facing side 56 of the first wall panel 43, and its second end 79 will be attached to the interior facing side 55 of the second wall panel 44. Additional nylon straps 76 will follow this alternating pattern of attachment to form the basket weave hinge 75. In FIG. 7, the portions of the nylon straps 76 which are attached to the interior facing side of the first or second wall panels 43, 44 are shown in phantom lines 80.

**[0060]** Referring now to FIGS. 1-6, in a preferred embodiment, at least one of the wall panels 50 includes a door opening 83 formed therethrough to facilitate ingress to or egress from the storage structure 10. The door opening 83 may best be appreciated in FIGS. 1, 5 and 6. Door openings 83 can also be present in more than one of the wall panels 50. For example, two adjacent wall panels, such as the first and second wall panels 41, 42 of the front wall 33 can each have door openings 83 formed

therethrough to provide a wide opening to the storage structure 10 (as shown in FIGS. 1, 2, 4, 5 and 6).

## **DOORS OR STRUCTURE CLOSURES**

**[0061]** Referring now to FIGS. 1, 2, and 3, the foldable storage structure 10 preferably includes at least one door 85. Door 85 can be coupled by hinges to at least one of the wall panels 50 at the door opening 83 to control ingress to and egress from the foldable storage structure 10. If the wall panels 50 include more than one door opening 83, more than one door 85 can be used to control ingress to and egress from the foldable storage structure 10. For example, two adjacent doors 85 may be used as shown in FIGS. 1, 2, and 4. The doors 85 can include various ornamentation or designs to improve their aesthetic appeal or function. For example, the doors can include windows 86. The door or doors may also include a lock mechanism or chain 87 which can be used to secure doors 85 in a closed, secured condition.

## **PANEL ATTACHMENTS**

**[0062]** A plurality of attachment points 88 are preferably located at the top and bottom edges 60, 61 of the wall panels 50 (See FIGS. 1-4).

Attachments 88 have features and are configured to facilitate the attachment of other components (*i.e.*, the roof assembly and floor assembly to the wall assembly 30) as will be described in detail below. The attachment points 88 can be configured to utilize any suitable method of attachment. For example, the attachment points 88 can use hook and loop, strap and buckle, strap and snap, or any combination of these to form a selectively releasable attachment.

#### **FOLDING ACTION OF WALL ASSEMBLY**

**[0063]** FIGS. 8A-E provide a series of diagrammatic representations showing a process whereby a wall assembly 30 in the folded configuration 90 (FIG. 8A) can be unfolded to be placed in the open, erect or unfolded configuration 91 (FIG. 8E). A top view of this same process is provided by FIGS. 9A-9E. In order to most clearly describe this process, the door opening 83 is not illustrated in FIGS. 8A-E and FIGS. 9A-E for easier understanding. However, in a preferred embodiment described above, at least one door opening 83 is provided.

**[0064]** As shown by FIGS. 8A and 9A, the wall assembly 30 can be placed in a folded configuration 90 for placement in pouch 102 to facilitate storage and/or transport of the wall assembly 30. In this folded

configuration 90, the walls 50 are in an essentially co-planar arrangement, with each of the walls (*i.e.*, wall panels 41, 42, 43, 44, 46, 47, 48, and 49) being folded one on the other. To provide this preferred flattened condition, the various hinge structures may have smaller or large spacing to accommodate the thickness of a partition wall sheet making the panels.

**[0065]** FIGS. 8B and 9B show a first group of wall panels 95 (*i.e.*, the second wall panel 42 of the front wall 33, the second wall panel 44 of the back wall 34, and the first and second wall panels 48, 49 of the left wall) being rotated away from a second group of wall panels 96 (*i.e.*, the first wall panel 41 of the front wall 33, the first wall panel 43 of the back wall 34, and the first and second wall panels 46, 47 of the right wall). This rotation continues until the first group of wall panels 95 and the second group of wall panels 96 are once again in an essentially co-planar relationship as shown in FIGS. 8C and 9C. As shown in FIGS. 8C and 9C, in this partially folded configuration, the front and back walls 33, 34 are in an unfolded configuration, while the right and left walls 35, 36 remain in a folded configuration.

**[0066]** Referring now to FIGS. 8D and 9D, the front and back walls 33, 34 are now urged apart, causing the right and left walls 35, 36 to begin unfolding. When the right and left walls 35, 36 have completely unfolded,

the wall assembly 30 takes on its rectangular shape, as shown in FIGS. 8E  
and 9E. In its unfolded configuration 91, the wall assembly 30 can be  
coupled to other components (described below) to form the storage  
structure 10. It should be noted, that the erect storage structure 10 can  
be once again re-folded to facilitate storage and/or transport of the wall  
assembly 30 by performing the reverse operations and actions described for  
unfolding.

## **THE ROOF ASSEMBLY**

**[0067]** Referring to FIGS. 1-14, the foldable storage structure 10 also  
includes a roof assembly 100. The roof assembly 100 may be best seen in  
FIGS. 4 and 10-14. The roof assembly 100 includes a roof member 101,  
and a roof skin or shell. The roof skin or shell is preferably of double layer  
construction and provides a flexible storage pouch 102 (Figure 11) in which  
all other parts of the structure 10 may be stowed for portage.

**[0068]** In preferred versions, the roof member 101 includes at least  
one foldable joint or hinged coupling 105 which joins a plurality of rigid roof  
panels 106. As best seen in FIGS. 10, 12 and 14, this implementation of  
the roof member 101 includes four roof panels 106. These include a first  
roof panel 111, a second roof panel 112, a third roof panel 113, and a

fourth roof panel 114. Each of the roof panels 106 has a front edge 118,  
a rear edge 119, and two side edges 120.

**[0069]** In one implementation, the roof member 101 can be one  
continuous piece of material having fold lines creased thereinto to provide  
foldable joints 105. This construction may enhance the stiffness or rigidity  
of the roof panels (*e.g.*, panels 111, 112, 113, and 114) by providing  
continuous support along the lines of joinder. In a more preferred  
alternative implementation, the roof assembly 101 can also include a  
plurality of individual roof panels 106 which are hinged at couplings 105.  
In another implementation, the roof member 101 may include two or more  
roof panels 106 which are hinged whereas other roof panels may be  
otherwise joined.

**[0070]** The foldable joints or hinged couplings 105 which join the roof  
panels 106 can be made of various suitable materials as described above.  
For example, in one implementation at least one of the foldable joints or  
hinged couplings 105 which join the roof panels 106 comprises a material  
selected from the group consisting of nylon strapping, webbing, fabric,  
plastic, leather and belting. The roof panel couplings 105 can be attached  
to the roof panels 106 by any suitable means. For example, the hinged

couplings 105 can be attached to the roof panels 106 by adhesives, double-  
faced tape, screws, bolts, braids, and/or heat welding.

**[0071]** In one embodiment, which may best be appreciated with  
reference to FIGS. 10 and 12, the hinged couplings 105 which join the roof  
panels 106 are a flexible basket weave hinge 125 made of nylon strapping.  
The flexible basket weave hinge 125 which is used to join the roof panels  
106 can be of the same design as the flexible basket weave hinge 75 which  
was described above with reference to FIGS. 3 and 7, and which was used  
to join the wall panels 50. For a detailed description of the flexible basket  
weave hinges 125, please see the detailed description provided above, as  
flexible basket weave hinges 75 and 125 are preferably of the same or  
similar design.

**[0072]** The roof panels 106 which comprise the roof member 101 are  
preferably lightweight, to facilitate set-up and take-down of the storage  
structure 10. Such panels 106 can be made of various suitable materials.  
For example, the roof panels 106 can comprise a material or materials  
selected from the group consisting of the preferred extruded polypropylene  
board, cardboard, honeycomb plastic, foam core board, polyvinylchloride  
sheets, metal, wood, and wax coated paper based materials.

**[0073]** Referring to FIGS. 11-13, roof assembly 100 also includes roof skin. The roof skin also preferably serves to cover or enclose the panel assembly 101 when unfolded to form the roof assembly. The roof skin is preferably two layer and configured to provide a flexible pouch 102. The flexible pouch 102 can be rectangular in shape, having four edges, a front edge 131, a back edge 132, a right edge 133, and a left edge 134. The flexible pouch 102 also includes an upper cover 138, and a lower cover 139. The upper and lower covers 138, 139 are sealed or joined at three edges to form the flexible pouch 102.

**[0074]** Any three of the edges may be sealed or joined to form the flexible pouch 102. For example, as shown in FIG. 12, the front edge 131, the right edge 133, and the left edge 134 can be sealed to form the pouch 102. These three edges 131, 133, and 134 can be connected or sealed in any suitable fashion, such as by sewing, adhesive attachment, heat sealed, or other suitable perimeter joinder and/or by banding using edging strips. The remaining edge, here the back edge 132 of the flexible pouch 102, is configured to be opened or closed to access an interior pocket 140 which has been formed. Back edge 132 is preferably provided with a closure. The closure may use couplings such as snaps, hook and loop materials, zippers, ties or other suitable connectors. These are preferably both strong



and easily opened and closed to open and close the pouch. Other roof  
pouch closures may also be suitable and within the various forms of the  
inventions described herein.

**[0075]** As shown in FIG. 12, the back edge 132 of the flexible pouch  
102 can be configured to be opened or closed, so that the rigid roof panels  
106 can be inserted into the interior pocket 140 of the flexible pouch 102.  
The back edge 132 of the flexible pouch 102 can be configured to be  
selectively releasably sealed in any suitable manner. For example, the back  
edge 132 can include openings 141 which facilitate the use of hooks,  
fasteners, snaps, or ties to selectively releasably seal the upper cover sheet  
138 to the lower cover sheet 139 at back edge 132.

**[0076]** The flexible pouch 102 can be made of any suitable material.  
For example, the flexible pouch 102 can be made of fabric, plastic, canvas,  
or a combination of these materials. The materials used can be water-  
proof, water-resistant, non-water-proof depending on the characteristics  
desired by the user. The flexible pouch 102 can also include various  
optional aesthetic features such as scalloped eaves 145 which are shown in  
FIGS. 1-4 and 11-13. Plain eaves, or other eave designs can also be utilized  
as desired to provide water shedding or sun blocking capabilities.

[0077] Referring again to FIGS 10-13, the flexible pouch 102 is configured so that the roof members 101 can be inserted into the interior pocket 140 of the pouch 102. The flexible pouch 102 is configured to enclose the roof members 101 in an unfolded configuration, thereby combining to form the roof assembly 100. The flexible pouch 102 containing the roof members 101, namely the roof assembly 100, is configured to be releasably coupled to the top edge 60 of the wall panels 50.

#### **FOLDING THE ROOF ASSEMBLY**

[0078] FIGS. 14A-D provide a series of diagrammatic representations showing a process whereby the roof member 101 is first shown in a folded configuration 150 (FIG. 14A), and is then unfolded to be placed in a flat or unfolded configuration 151 (FIG. 14D).

[0079] As shown by FIG. 14A, the roof member 101 can be placed in a folded configuration 150 to facilitate placement in pouch 102, for storage and/or other transport of the roof member 101. In this folded configuration 150, the roof panels 106 are in an essentially co-planar arrangement, with each of the roof panels (*i.e.*, roof panels 111, 112, 113, and 114) being folded one on the other.

**[0080]** FIG. 14B shows the first and second roof panels 111, 112 being rotated away from the third and fourth roof panels 113, 114 to begin unfolding the roof member 101. This unfolding continues until the roof panels 106 are once again in an essentially co-planar relationship as shown in FIG. 14D.

**[0081]** When the roof panels 106 are in the unfolded configuration 151 (as shown in FIGS. 10, 12, and 14D), the roof member 101 can be inserted into the interior pocket 140 of the flexible pouch 102. For example, FIG. 12 shows the unfolded roof member 101 being inserted into the interior pocket 140 of the flexible pouch 102. The flexible pouch 102 is designed to securely hold the roof member 101 in an essentially unfolded position 151. However, when the roof assembly 100 is releasably coupled to the top edge 60 of the wall panels 50, the flexible pouch 102 allows enough movement of the roof panels 106 so that the roof panels 106 and flexible pouch 102 can conform to the top edges 60 of the wall panels 50 to create the desired roof shape.

**[0082]** As noted above, the height of the wall panels 50 can be varied or adapted to accommodate a variety of roof shapes, such as gambrel, gable, shed, curved or flat roofs. The use of any suitable roof shape is

contemplated. As one example, the storage structure 10 shown in FIGS. 1-  
4 has a gambrel roof shape.

## **THE FLOOR ASSEMBLY**

**[0083]** Referring now to FIGS. 4, 15 and 16, a preferred but optional floor assembly is generally indicated by the numeral 160. In one implementation, the floor assembly 160 can be described as being a generally rectangular floor member 161 having at least one foldable joint or hinged coupling 165 which defines a plurality of rigid floor panels 166. As shown, the floor assembly 160 can include a first floor panel 170, and a second floor panel 171.

**[0084]** Each of the floor panels 166 has a front edge 175, a back edge 176, an outer side edge 177, and an inner side edges 178. Each of the floor panels 166 has an upper surface 179, and a lower surface 180.

**[0085]** In one implementation, the floor assembly 160 has at least one foldable joint 165 which defines a plurality of floor panels (*e.g.*, first and second floor panels 170, 171). In this implementation, the floor assembly 161 can be one continuous piece of floor material having foldable joints 165 which define the first and second floor panels 170, 171. In another implementation, the floor assembly 160 can include a plurality of individual

floor panels 166 which are hingedly coupled at foldable joint or coupling 1  
165. Thus, in some implementations, the floor assembly 160 can include 2  
a plurality of individual floor panels 166 which are hingedly coupled. 3

**[0086]** In one implementation, the floor assembly 160 includes a 4  
plurality of hingedly coupled rigid floor panels 166. The foldable joints or 5  
hinged couplings 165 which join the floor panels 166 can be made of any 6  
suitable material. For example, in one implementation at least one of the 7  
foldable joints or hinged couplings 165 which join the floor panels 166 8  
comprises a material selected from the group consisting of nylon strapping, 9  
webbing, fabric, plastic, leather and belting. The hinged couplings 165 can 10  
be attached to the floor panels 166 by any suitable means. For example, 11  
the hinged couplings 165 can be attached to the floor panels 166 by 12  
adhesives, double-faced tape, screws, bolts, brads, and/or heat welding. 13

**[0087]** In one embodiment, which may best be appreciated with 14  
reference to FIGS. 4 and 15, the hinged coupling 165 which join the floor 15  
panels 166 are a flexible basket weave hinge 185 made of nylon strapping. 16  
The flexible basket weave hinge 185 which is used to join the floor panels 17  
166 can be of the same design as the flexible basket weave hinge 75 which 18  
was described above with reference to FIGS. 3 and 7, and which was used 19  
to join the wall panels 50. For a detailed description of the flexible basket 20

weave hinges 185, please see the detailed description provided above, as  
flexible basket weave hinges 75 and 185 are preferably of the same or  
similar design.

**[0088]** The floor panels 166 which comprise the floor assembly 160 are  
preferably lightweight to facilitate set-up and take down of the storage  
structure 10. Such panels 166 can be made of any suitable material. For  
example, the floor panels 166 can comprise materials selected from the  
group consisting of extruded hollow core polypropylene, cardboard,  
honeycomb plastic, foam core board, polyvinylchloride sheets, metal, wood,  
wood based and other lightweight composite materials. Non-skid strips can  
be applied to the floor panels 166 to provide better traction for those  
walking on the floor.

**[0089]** The floor assembly 160 is advantageously configured to be  
releasably coupled to the bottom edge 61 of the wall panels 50. As shown  
in FIGS. 4 and 15, a plurality of connectors 187 can be attached to the  
front edge 175, back edge 176, and outer side edge 177 of the floor panels  
166. These connectors 187 can be configured to releasably couple to the  
bottom edge 61 of the wall panels 50. The connectors 187 can be  
configured to utilize any suitable method of attachment. For example, the

connectors can use hook and loop, strap and buckle, strap and snap, or any combination of these or other connectors to form an attachment.

## **FOLDING THE FLOOR ASSEMBLY**

**[0090]** FIGS. 16A-C provide a series of diagrammatic representations showing a process whereby the floor assembly 160 is first shown in a folded configuration 190 (FIG. 16A), and is then unfolded to be placed in a flat or unfolded configuration 191 (FIG. 16C).

**[0091]** As shown by FIG. 16A, the floor assembly 160 can be placed in a folded configuration 190 to facilitate storage placement in pouch 102 and/or transport of the floor assembly 160. In this folded configuration 190, the floor panels 166 are in an essentially co-planar arrangement, with each of the floor panels (*i.e.*, first and second floor panels 170, 171) being folded one on the other. FIGS. 16B show the first and second floor panels 170, 171 being rotated away from one another to begin unfolding the floor assembly 160. This unfolding continues until the floor panels 166 are once again in an essentially co-planar relationship as shown in FIG. 16C. When the floor panels 160 are in the unfolded configuration 191 (as shown in FIGS. 4, 15, and 16C), the floor assembly 160 can be releasably coupled to the bottom edge 61 of the wall panels 50 by connectors 187.

## METHODS FOR ERECTING THE STORAGE STRUCTURES

**[0092]** The present invention includes methods of erecting the foldable storage structure 10. The methods may include providing a flexible pouch 102 which contains a disassembled storage structure 10 in a folded configuration. The flexible pouch 102 which is provided, contains a wall structure assembly, such as the eight rigid wall panels 50 in a folded configuration 90, a plurality of rigid roof panels 106 in a folded configuration 150, and a plurality of rigid floor panels 166 in a folded configuration 190. The method includes removing the wall panels 50, the plurality of roof panels 106, and the plurality of floor panels 166 from the flexible roof pouch 102. The method includes unfolding the wall panels 50 to form a rectangular enclosure 31 having a top edge 60 and a bottom edge 61. The method also includes unfolding the plurality of roof panels 106, and then after unfolding the plurality of roof panels 106, placing the plurality of roof panels 106 inside of the flexible pouch 102 to form a roof assembly 100. The roof assembly 100 is releasably coupled to the top edge 60 of the rectangular enclosure 31. The method also includes unfolding the plurality of floor panels 166, and then after unfolding the plurality of floor



panels 166, releasably coupling the plurality of floor panels 166 to the  
bottom edge 61 of the rectangular enclosure 31.

## **SECOND EMBODIMENT ROOF COVER AND POUCH**

**[0093]** FIGS. 17-21 show a preferred second embodiment roof  
cover 200. The features of roof cover 200 include a pouch for carrying the  
folded and contracted wall, roof and floor panel assemblies discussed above  
or ones substantially similar thereto. Cover 200 also has features that serve  
to fold shut the pouch opening.

**[0094]** As shown, this embodiment further shows a cover which either  
or both folds an opening side flap and an end flap. This is used to reduce  
the overall width and length of the completely knocked-down and encased  
structure in the storage or stowage condition. The foldable panel  
assemblies and the stowed unit thus become easily portable and carrying  
case cover protect the folding panel assemblies for transport and stowage.  
This may be in a storage compartment of a recreational vehicle, a boat,  
home storage shelving or wherever the unit is stored. Further specifics of  
the second embodiment will now be described with aid and in light of the  
first embodiment description.

**[0095]** FIG. 17 shows a top view of the cover 200 in a fully flattened condition. Cover 200 has a front edge 204, back edge 205, foldable right end 206 and a left end 207. The front edge 204 is advantageously provided with an eave 202 which provides greater aesthetic appeal and serves to improve weather resistance by overhanging the joinder between the front wall and roof assembly.

**[0096]** As shown, cover 200 is made with a relatively heavy nylon fabric which is rip and tear resistant. It is also advantageously provided with a water resistant coating that lines the inside of both top layer 201 and bottom layer 203 (FIG. 18). The top layer 201 of cover 200 is positioned upward when installed upon the wall assembly or assemblies. The bottom layer is facing the interior of the structure.

**[0097]** FIG. 17 also shows that the top layer 201 of cover 200 has a top layer longitudinal row 212 of snaps 210 or other suitable connectors. The top layer also preferably includes a series of end snaps or other suitable connections 213. Another snap or other connector 214 is provided for securing the end flap when folded over. Snap connector 214 engages with a mating snap connector 218 (FIG. 18) when the side and end flaps 254 and 253 are folded and properly fastened.

**[0098]** The cover 200 is provided with a pouch (not shown in Fig. 17) which may be used to store the folding panel assemblies. After the folding panel assemblies are inserted into the pouch, then the cover is folded along a first fold line 241 which runs longitudinally. This causes a side flap 254 to double over adjacent parts of the cover. The cover may also be folded along a second fold line 242 which runs transversely toward one end of the cover. The second fold line 242 defines an end flap area 253. The operation of such flaps will be described further below.

**[0099]** The cover may be advantageously provided with a binding or edging 209 which extends along edges 204-207. This can be a sewn-on strip of heavier nylon fabric or other suitable edging material. This helps to protect the edges against wear and tear.

**[0100]** FIG. 18 shows the opposing bottom side of cover 200 in a fully flattened condition. The bottom side is made from a bottom layer 203 of fabric or other suitable material whereas the top side is made from a top layer of fabric or other suitable material. The layers are preferably flexible.

**[0101]** The two cover layers are joined along the perimeter at edges 204, 206 and 207 by sewing, glueing, heat welding and/or other suitable joiner techniques. The two layers are open (disconnected) or detachably

connected near back edge 205 to allow access to an internal compartment  
of a storage pouch 250 formed between the two layers of the cover.

**[0102]** The mouth of the storage pouch 250 is adjacent the outer edge  
of a first reinforcement strip 261. Strip 261 is sewn, glued, welded, etc. to  
become a part of the bottom layer. It is a longitudinal reinforcement strip  
which extends between the end edges 206 and 207. As shown, the bottom  
layer also advantageously has similar second and third longitudinal  
reinforcement strips 262 and 263. An end reinforcement strip 264 may  
further be included.

**[0103]** The first longitudinal reinforcement strip 261 has a group of  
snaps 211 having individual snap pieces or other suitable connectors 231.  
Snaps 231 mate with snaps 210 mounted in the top layer. This connection  
causes the pouch opening to be fastened closed. This occurs most  
frequently when the roof panel assembly is installed therein in the unfolded  
condition and the roof assembly is ready for mounting upon the erected  
wall panel assembly.

**[0104]** The first strip 261 is also provided with appropriately positioned  
hook and loop connection pieces 221 for connection to the wall panel  
assembly with mating connectors mounted thereon.

**[0105]** The second reinforcement strip 262 is provided with another group or series of snaps or other suitable fasteners or connectors 217. Snaps 217 are coordinated to connect with snaps 210 of series 212 when the longitudinal flap is folded over along fold line 241. In this condition, the snaps 231 of series 211 are disconnected from snaps 210 and displaced inward.

**[0106]** Third longitudinal reinforcement strip 263 is provided with a series of connectors 221 which may be hook and loop type fasteners for connection to the top edge of the wall panel assembly when the unit is erected.

**[0107]** The transverse reinforcement strip 264 is provided with snaps 213 which engage and mate with snaps 267 on the second transverse reinforcement strip 265 when the end flap 253 is folded along fold line 242. Snap 218 on strip 264 connects with snap 214 on the face of upper layer 201 when the cover is fully folded into a closed storage position.

#### **ASSEMBLY OF STRUCTURE INTO STORAGE CONDITION**

**[0108]** FIG. 19 shows the cover with portions of the bottom layer 203 broken away to better illustrate the approximate manner that the folded panel assemblies are stored therein. The floor panel assembly 160 is

positioned in the pouch 250 in a folded condition as described above and  
inserted between the layers. The folded floor assembly 160 is positioned  
toward the right edge 207 although some play is possible. The folded wall  
panel assembly is shown on top of assembly 160 and is positioned  
approximately against or tight against the right edge 207. The folded roof  
panel assembly 101 is shown positioned on top of the wall panel  
assembly 90.

**[0109]** FIGS. 18-22 show the cover in different stages. FIG. 18 shows  
the unloaded cover from the bottom side ready to receive the folded panel  
assemblies. The mouth of pouch 250 is opened by detaching the snaps of  
group 211 from those of group 212. Then the panel assemblies are  
inserted into the pouch, such as illustrated in FIG. 19.

**[0110]** FIG. 20 shows the longitudinal flap 254 folded over adjacent  
portions of the cover and fold line 241 becomes the lower edge. Snaps 212  
are then coupled to snaps 217 to connect the longitudinal flap and close the  
mouth of the pouch. This also narrows the transverse width size of the  
folded cover assembly.

**[0111]** FIG. 21 shows another step where the end flap 253 is folded  
along fold line 242. The end flap is detachably secured by connecting the

snaps 213 to snaps 267. The bottom of the edge 206 is coupled using  
snaps 214 and 218 and are not apparent in the view of FIG. 21.

**[0112]** FIG. 22 shows another optional condition wherein the folded  
storage assembly of FIG. 21 is further provided with a series of encircling  
bands or straps 264 which can be of various types and sizes. The encircling  
straps preferably have a connector which allows the strap to be tightened  
about the assembly to better secure it in the storage condition. Straps 264  
also serve as carrying handles by inserting the hands beneath the straps  
and lifting the assembly.

**[0113]** Straps 264 may further serve an added optional purpose of  
being guys which can be connected at the top corners of the wall assembly  
and staked to the ground or otherwise mounted upon a supporting surface  
to stabilize the erected structure against wind, rain and snow.

## **OPERATION AND FURTHER ASPECTS**

**[0114]** Advantageously, the foldable storage structure 10 may also be  
contracted or collapsed. This includes the wall assembly 30, the roof  
assembly 100, and the floor assembly 160, which all can be easily placed  
in a folded configuration and stored in the flexible pouch 102 for storage  
and/or transport. Transport of the foldable storage structure 10 is further

facilitated by the fact that when the foldable storage structure 10 is placed  
in a folded configuration and stored in the flexible pouch 102, the flexible  
pouch 102 containing the foldable storage structure 10 (in the folded  
configuration) is so dimensioned as to be insertable into a cargo  
compartment of a recreational vehicle. The foldable storage structure 10  
is preferably configured to be assembled and disassembled without tools.

**[0115]** The methods, operation and further aspects of the described  
embodiments of the present invention are believed to be apparent from the  
description given herein. For convenience they will be briefly summarized  
at this point.

**[0116]** In one aspect, the present invention relates to a foldable  
storage structure 10. The foldable storage structure 10 includes a  
rectangular enclosure 31 having foldable joints 70 which define eight  
effectively rigid wall panels 50. Each of the wall panels 50 have a top edge  
60 and a bottom edge 61, and at least one of the wall panels 50 includes  
a door opening 83 formed therethrough.

**[0117]** The foldable storage structure 10 includes a roof member 101  
having at least one foldable joint 105 which defines a plurality of rigid roof  
panels 106. The foldable storage structure 10 also includes a roof skin or  
envelope, preferably in the form of flexible pouch 102 which is configured



to enclose the roof panels 106 to form a roof assembly 100. The roof assembly 100 is configured to be releasably coupled to the top edge 60 of the wall panels 50.

**[0118]** The foldable storage structure 10 also includes a floor assembly 160 having at least one foldable joint 165 which defines a plurality of rigid floor panels 166. The floor panels 166 are configured to be releasably coupled to the bottom edge 61 of the wall panels 50.

**[0119]** In one preferred embodiment, the foldable storage structure 10 includes a door 85 which is pivotally coupled, such as by hinge structures, to at least one of the wall panels 50 at the door opening 83 to control ingress to and egress from the foldable storage structure 10.

**[0120]** The joints which connect various panels of the foldable storage structure 10 can be made from various suitable materials. For example, in one variation, at least one of the foldable joints 70 which define the rigid wall panels 50 is made from a material selected from the group consisting of nylon strapping, webbing, fabric, plastic, leather and belting. In another variation, at least one of the foldable joints 50 which define the plurality of rigid roof panels 106 comprises a material selected from the group consisting of nylon strapping, webbing, fabric, plastic, leather and belting. In another variation, at least one of the foldable joints 165 which define the

plurality of rigid floor panels 166 comprises a material selected from the group consisting of nylon strapping, webbing, fabric, plastic, leather and belting. In one preferred embodiment, at least one of the foldable joints 70 which define the wall panels 50 is a flexible basket weave hinge 75 made of nylon strapping 76 or other enumerated material or their equivalent.

**[0121]** In another variation, the rigid wall panels 50 comprise a material selected from the group consisting of extruded hollow core polypropylene board, cardboard, plastic, foam core board, polyvinylchloride sheet, metal, wood and wood based materials.

**[0122]** In other embodiments, the foldable storage structure 10 includes a wall assembly 30 including eight rigid wall panels 50, each wall panel (*i.e.*, 41, 42, 43, 44, 46, 47, 48 and 49) having a top edge 60 a bottom edge 61 and side edges 62. The side edges 62 of the wall panels 50 are hingedly coupled to form a rectangular enclosure 31, and at least one of the wall panels 50 includes a door opening 83 formed therethrough. The foldable storage structure 10 includes a roof assembly 100 including a plurality of hingedly coupled rigid roof panels 106, and a flexible pouch 102 which is configured to enclose the roof panels 106. The roof assembly 100 is configured to be releasably coupled to the top edge 60 of the wall panels

50. The foldable storage structure 10 also preferably includes a floor assembly 160. The floor assembly 160 includes a plurality of pivotally coupled rigid floor panels 166, and is configured to be releasably coupled to the bottom edge 61 of the wall panels 50.

**[0123]** In yet another embodiment, the foldable storage structure 10 includes eight wall panels 50, each of the wall panels 50 having a top edge 60 a bottom edge 61 and side edges 62. The side edges 62 of the wall panels 50 are hingedly coupled to form a rectangular enclosure 31. At least one of the wall panels 50 includes a door opening 83 formed therethrough. The foldable storage structure 10 also includes a plurality of hingedly coupled roof panels 106, and a flexible pouch 102 which is configured to enclose the roof panels 106. The flexible pouch 102 is also configured to be releasably coupled to the top edge 60 of the wall panels 50. The foldable storage structure 10 also includes a plurality of hingedly coupled floor panels 166. The floor panels 166 are configured to be releasably coupled to the bottom edge 61 of the wall panels 50.

## **Further Aspects and Features**

**[0124]** The above description has set out various features and aspects of the inventions developed by the inventors and the best mode and certain

preferred embodiments are shown and described. Such aspects and features may further be described and defined according to the following claims which may individually or in various combinations help to define the invention.

### **Interpretation Note**

**[0125]** The invention has been described in language directed to the current embodiments shown and described with regard to various structural and methodological features. The scope of protection as defined by the claims is not intended to be necessarily limited to the specific features shown and described. Other forms and equivalents for implementing the inventions can be made without departing from the scope of concepts properly protected hereby.